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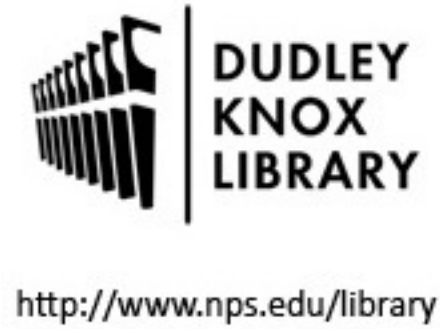

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MANAGEMENT IMPROVEMENT OF NAVAL HOSPITAL OUTPATIENT DEPARTMENT FUNCTION THROUGH THE USE OF ADP

John Richard Kozik

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MANAGEMENT IMPROVEMENT OF NAVAL HOSPITAL OUTPATIENT DEPARTMENT FUNCTIONS THROUGH THE USE OF ADP

BY

John Richard Kozik

Bachelor of Arts

The George Washington University, 1966

A Thesis Submitted to the School of Government and Business Administration of The George Washington University in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

April, 1970

Thesis directed by

Professor Elizabeth B. Adams

Professor of Business Administration

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CHAPTER I

INTRODUCTION

The outpatient departments in military hospitals are routinely a veritable beehive of activity. Five days a week, eight hours a day, year in and year out, an incredible number of patients are treated for every imaginable disease and injury. It is estimated that approximately 4,797,000 men, women and children have been treated in naval hospitals and medical centers throughout the United States and overseas during fiscal year 1969.[1]

The estimated number of clinical outpatient visits for fiscal year 1969 represents a 31.4 percent increase from fiscal year 1965.[2] This pattern of growth in outpatient visits is depicted in the Appendix. The pie diagram in the Appendix also illustrates the percentage of visits by patient category for fiscal year 1967. It is easily visualized that dependents comprise the majority of the outpatient visits for that year. For the ten-year period

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[1] Interview with CDR F. O. McClendon, MSC, USN, Management Information Center, Bureau of Medicine and Surgery, Navy Department, Washington, D.C., on October 29, 1969.

[2] Ibid.

1958-1967, dependent outpatient medical care has steadily increased and will continue to spiral.[1]

However, the increased outpatient workload has not manifested itself in a commensurate increase in personnel staffing. The strength of the naval medical department has increased approximately 22 percent since 1965.[2] The major reason for this increase can be attributed to the conflict in Southeast Asia. It can logically be expected that there will be a decrease in the number of professional medical and paramedical personnel when military forces are reduced.

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[1]Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1958, p. 49.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1959, p. 48.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1960, p. 40.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1961, p. 31.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1962, p. 33.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1963, p. 32.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1964, p. 16.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1965, p. 15.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1966, p. 17.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1967, p. 17.

Bureau of Medicine and Surgery, Statistics of Navy Medicine, Fiscal Year 1968, p. 17.

[2]Interview with CDR F. O. McClendon.

A realistic presumption may be made that the number of outpatient visits will decline once the active duty strength of the U.S. Navy and Marine Corps is reduced. This is valid, but outpatient treatment will still represent a significant requirement for the naval hospital. For example, the increased workload that has been fostered upon various treatment facilities as a result of the military build-up has necessitated a reduction of medical care to other beneficiaries; i.e., retired personnel and their eligible dependents. Many of the medical benefits that retired personnel have taken for granted have been reduced because of the military build-up. The retired man has had to utilize the services of civilian medical treatment institutions for care. In many cases, this has resulted in an increased financial burden upon the individual family. Retired personnel who have previously depended upon medical care at military treatment activities will once again return to the military hospital for medical care which they are entitled to receive.[1] It should also be recognized that the retired strength will continue to grow over the coming years.

The outpatient department in naval hospitals is "big business" and will continue to be so in the future. Effective and efficient management must be practiced if the outpatient department administrator is to continue to provide the services which the consumer expects to receive. Reports to higher authority must be accurate because the allocated budget to operate medical facilities reflects the volume of workload. Workload figures must be assembled in such a manner that they may be easily analyzed by top management and support requests for increases in resources. Budgetary constraints and reduction in personnel

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[1]Department of Defense, "Uniformed Services Health Benefit Program," June 1967, p. 10.

and funds have added to the burden of each administrator to achieve his assigned mission.

As the manager's resources of money, material, and personnel diminish, management improvement methods must be sought to accomplish organizational goals. Is automation the answer to the manager's dilemma? It is the purpose of this research to investigate the feasibility of applying electronic data processing to selected outpatient administrative functions in naval hospitals.

All naval hospitals have access to ADP equipment of varying degrees of sophistication. This equipment has been used routinely for preparing payrolls, in supply management, and for statistical analyses. The feasibility of utilizing available ADP equipment as a tool for managing the medically oriented functions of a hospital has not been investigated.

Research Question

Thus, the primary research question is: How can the management of the outpatient department of a naval hospital be improved by ADP?

Concomitant with this basic question are several subsidiary questions. What administrative tasks are carried out by naval hospital outpatient departments? What ADP applications are utilized by non-naval outpatient departments? What applications should be automated in naval hospitals? Can the planning and control functions of management be improved through the application of ADP? Finally, what benefits can be expected through automation?

Scope and Organization

The scope of this study will be limited to the management of a naval hospital outpatient department. It should be recognized that an outpatient department is a subsystem within the total hospital system. This subsystem

can be broken down into component parts such as patient care and treatment, patient appointment system, record handling system, and statistical analysis system. It is these latter three components that will be examined. Interfacing with the outpatient department subsystem are other subsystems such as supply management, payroll, and accounting.

This thesis will answer the primary and subsidiary questions as previously stated. To accomplish this end, it will review and discuss related current literature, investigate and analyze available data, and synthesis the information obtained from interviewees, all pertaining to the subject of automation and the outpatient department.

Chapter II will show the existing method of operations of one of the largest naval hospital outpatient departments in the United States or elsewhere--Naval Hospital, Bethesda, Maryland. The operations of the department will be analyzed to gain an understanding of the administrative functions performed, Workload statistics for recent years and projected trends will be gathered in order to appreciate the magnitude of the scope of operations. Staffing figures will also be examined and discussed. The functions of the patient appointment system and records handling system will be analyzed in depth. These represent two areas which are universal problems in all hospitals, military and civilian. Finally, the department's reporting system to higher authority will be examined and discussed.

In Chapter III, the current trends in automating certain administrative functions in non-naval hospital outpatient departments will be discussed. In particular, appointment systems, and management reporting systems will be investigated and evaluated.

Chapter IV will discuss efforts that have been made in automating the medical record.

Chapter V will discuss the effectiveness of the Outpatient Department, Naval Hospital, Bethesda, and examine the costs and benefits associated with an automated department.

The final chapter will address conclusions.

Research Methods Utilized

Personal interviews will represent a primary source of gathering data germane to the issue. The interviews will be with responsible individuals who are knowledgeable in the fields of managing outpatient departments and those individuals who are proficient in the area of data processing. In addition, research of current literature will be undertaken.

CHAPTER II

EXISTING METHODS OF OPERATION

Introduction

The Naval Hospital, Bethesda, Maryland, is one of the largest military hospitals within the Department of Defense establishment.

The present outpatient department opened its doors in May of 1963 after undergoing extensive modernization and expansion. The department is located in a separate wing of the hospital. Organizationally, it is under the direction of a Captain of the Medical Corps, U.S. Navy. He is assisted in carrying out the administrative details of the department by a Lieutenant Commander in the Medical Service Corps (Health Care Administration Section).

The department is composed of thirty-seven individual clinics which provide a diverse range of outpatient services.[1] On a continuum, the studies go from simple to complex; for example, from routine allergy work-ups to sophisticated organ transplant evaluations.[2]

Twelve naval medical officers are assigned full-time to the outpatient department.[3] This total includes the Chief of Service and eleven general

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[1]Interview with LCDR R. C. Butler, MSC, USN, Administrative Assistant, Outpatient Department, Naval Hospital, Bethesda, Md., November 14, 1969.

[2]Ibid.

[3]Ibid.

practitioners. Ten of the physicians are assigned to the walk-in or general practice clinic; one is assigned to the emergency room. In addition to the full-time staff, there are one hundred and four staff medical officers who serve part-time in the various outpatient clinics.[1] These medical officers are assisted by eighteen interns and ninety-eight residents.[2] Also, twenty-eight civilian nurses and nurses' aides assist in the patient examination and treatment function in the clinics.[3] There are an additional twenty-one military and civilian personnel who provide administrative support services allied to medical treatment.[4] They are not directly connected with patient care activities but are concerned with the administrative details of the outpatient department.

The outpatient department is a self-contained unit. It has its own staff, treatment facilities, clinical laboratory, x-ray, and pharmacy services. However, the department must rely upon the hospital for additional adjunct services which are beyond its capabilities.

Evaluation of Workload Trends

The Naval Hospital, Bethesda, Maryland, serves a population of approximately 128,000 eligible recipients of medical care.[5] The population includes members of the uniformed services, their dependents, retired personnel

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[1] Ibid.

[2] Ibid.

[3] Ibid.

[4] Ibid.

[5] Logistic Support Requirement System Questionnaire, Naval Hospital, Bethesda, Md., November, 1967.

and their dependents, and all other eligible beneficiaries who reside in the zone of responsibility assigned to the Naval Hospital, Bethesda, Maryland.

For fiscal year 1968, the clinical workload for the outpatient department totaled over 446,000 visits.[1] This represents a 12 percent increase over the number of visits for fiscal year 1967.[2]

The Appendix depicts the growth in monthly outpatient visits from calendar year 1964 through October 1969. Hospital sources anticipate that the outpatient workload will peak at 500,000 visits by the close of calendar year 1969 (42,000 average visits per month.)[3]

Individual clinic workload varies as can be expected. The clinic that traditionally experiences the greatest volume of patients is the walk-in or general practice clinic. This clinic functions as a screening clinic for all conditions. If specialized or follow-up treatment is required, the patient is referred to the appropriate clinic. An important factor which should be emphasized is that the general practice clinic does not utilize an appointment system. This also explains the heavy workload. Gynecology, ophthalmology, and pediatrics are the leaders in number of visits among the scheduled appointment clinics.

Clinical workload for the next four years should remain at approximately the same level. The basis for this statement is that the projected population supported is expected to remain at over 128,000 eligible beneficiaries of medical care.[4]

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[1]Medical Services Report, NAVMED 1454, Naval Hospital, Bethesda, Md., for fiscal year 1968.

[2]Medical Services Report, NAVMED 1454, Naval Hospital, Bethesda, Md., for fiscal year 1967.

[3]Interview with LCDR Butler.

[4]Logistic Support Requirement System Questionnaire.

Discussion of Appointment System

All clinics with the exception of the walk-in clinic and emergency room utilize a central appointment system. No appointments for outpatients are made by the individual clinics. They are made at the appointment desk centrally located in the reception area of the outpatient department.

Each week the appointment clerks receive a master sheet from every clinic. An example of the master sheet is illustrated in figure 1. The master sheet lists the names of physicians assigned to each clinic, and the days and times by quarter-hours when each physician is available for patient examination and treatment. This schedule covers clinic operations for the fourth week in advance.

The four week in advance system is the limit which the department can safely utilize in scheduling appointments. It is believed that scheduling further than four weeks in advance would result in appointments not kept by the patient. This system has not resulted in any problem whatsoever with "no shows" for appointments.[1] To schedule patients further than four weeks in advance could also result in physicians not being available because of professional commitments or leaves of absence. This method has worked well for the department, and no problem with either patient or physician unavailability has been encountered.

Once the appointment clerk receives the master sheet from the individual clinic, she checks for accuracy the month, date, and weekday. She then prepares an individual appointment card for each physician for each day of the week. The card, as shown in figure 2, contains the following information: (1) Name of physician; (2) name of clinic; (3) weekday; (4) date; (5) month. The appointment card is lined off into fifteen-minute segments beginning at 8:00 a.m.

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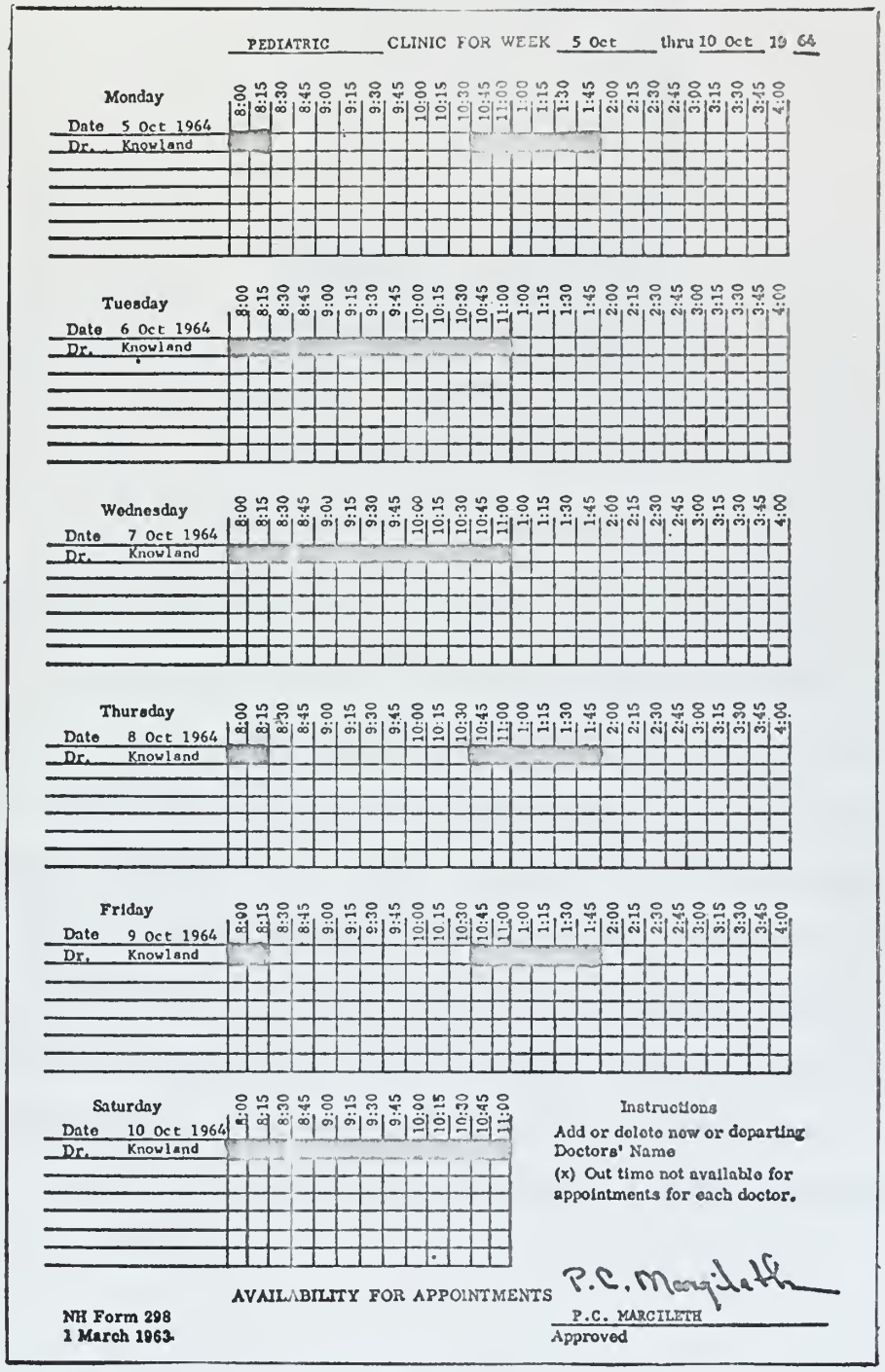
[1]Interview with LCDR Butler.

until 4:00 p.m. The appointment clerk inks out with a felt-tipped marker the quarter-hour segments during which the physician is not available for appointments. These intervals correspond to the times which are noted on the master available for appointment list which is prepared by the individual clinic.


PEDIATRIC CLINIC FOR WEEK 5 Oct thru 10 Oct 19 64

Monday
Date 5 Oct 1964
Dr. Knowland

Tuesday
Date 6 Oct 1964
Dr. Knowland

Wednesday
Date 7 Oct 1964
Dr. Knowland

Thursday
Date 8 Oct 1964
Dr. Knowland

Friday
Date 9 Oct 1964
Dr. Knowland

Saturday
Date 10 Oct 1964
Dr. Knowland

8:00 8:15 8:30 8:45 9:00 9:15 9:30 9:45 10:00 10:15 10:30 10:45 11:00 1:00 1:15 1:30 1:45 2:00 2:15 2:30 2:45 3:00 3:15 3:30 3:45 4:00

Instructions
Add or delete new or departing Doctors' Name
(x) Out time not available for appointments for each doctor.

AVAILABILITY FOR APPOINTMENTS

P.C. Marcileth
P.C. MARCILETH
Approved

NH Form 298
1 March 1963

Fig. 1.--Master appointment sheet

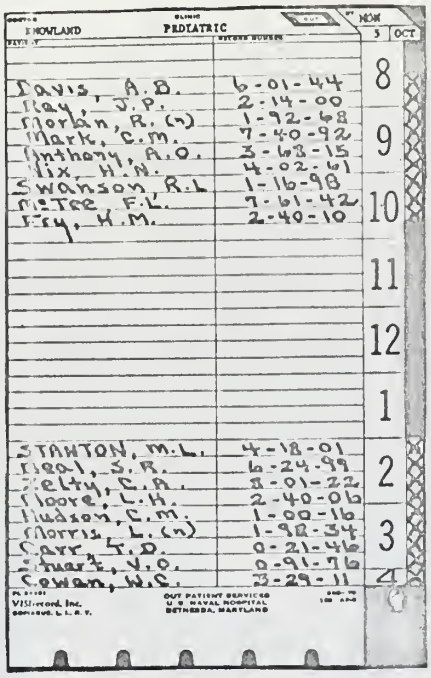


Fig. 2.--Physician appointment card

Appointment cards are then sorted in three operations, by (1) name of physicians in alphabetical order; (2) name of clinic; and (3) month and date, numerically in sequence with the earliest date on top of the stack of cards.[1]

The cards are then filed in an appointment bin. The bin has a divider which identifies the clinic and also a tab for each physician within that particular clinic. The appointment cards are filed so that the date and time segments are visible to the clerk. Thus, the appointment clerk has available to her a four-week schedule for each physician in each clinic for which she schedules appointments. The number of clinics is divided among five appointment clerks. Each one is responsible for maintaining the appointment cards for her share of clinics.

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[1]Charles A. Holston, "Central Appointment System for Outpatient Clinics," Hospital Management, October 1967, p. 68.

An information lead card, as shown in figure 3, is placed in front of the first card for each physician. This card contains information which tells the clerk what type patient to schedule on each day. For example, new patients are seen on certain days of the week while follow-up patients are seen on other days. The lead card can also contain instructions which the clerk is to relay to the patient. As an example, new patients to be seen in the orthopedic clinic should report thirty minutes in advance of their appointment time for necessary x-ray examinations.

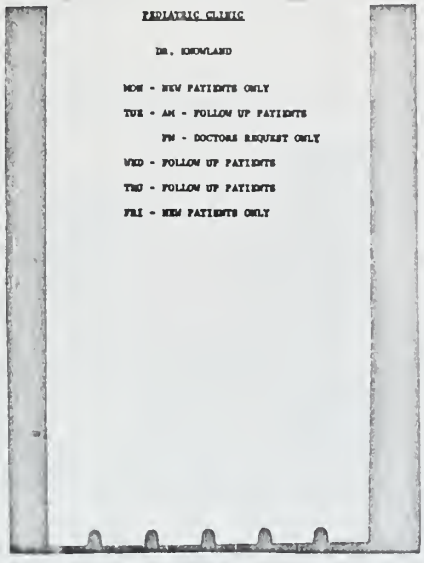
PEDIATRIC CLINIC
DR. KNOWLAND
MON - NEW PATIENTS ONLY
TUE - AM - FOLLOW UP PATIENTS
PM - DOCTORS REQUEST ONLY
WED - FOLLOW UP PATIENTS
THU - FOLLOW UP PATIENTS
FRI - NEW PATIENTS ONLY

Fig. 3.--Information lead card

Appointments are made in one of three ways: (1) The patient visits the outpatient department to obtain an appointment; (2) The patient telephones the department for an appointment; (3) The patient requests an appointment by mail.

In the first two instances, the appointment clerk determines the name of the clinic and the physician desired by the patient. The clerk scans the appointment bin and locates the correct clinic and physician. She has already

marked out the time during which the physician will not be available on each day for the four-week period. She then offers an appointment on a particular day and time to the patient. If this appointment is agreeable to the patient, the clerk removes the appointment card from the bin. She then enters the name of the patient and the outpatient chart number on the line opposite the time and marks out the time which is printed along the right margin of the card.

Once the appointment card has been completed, the clerk prepares the appointment slip which consists of an original and three copies. The appointment slip is depicted in figure 4.

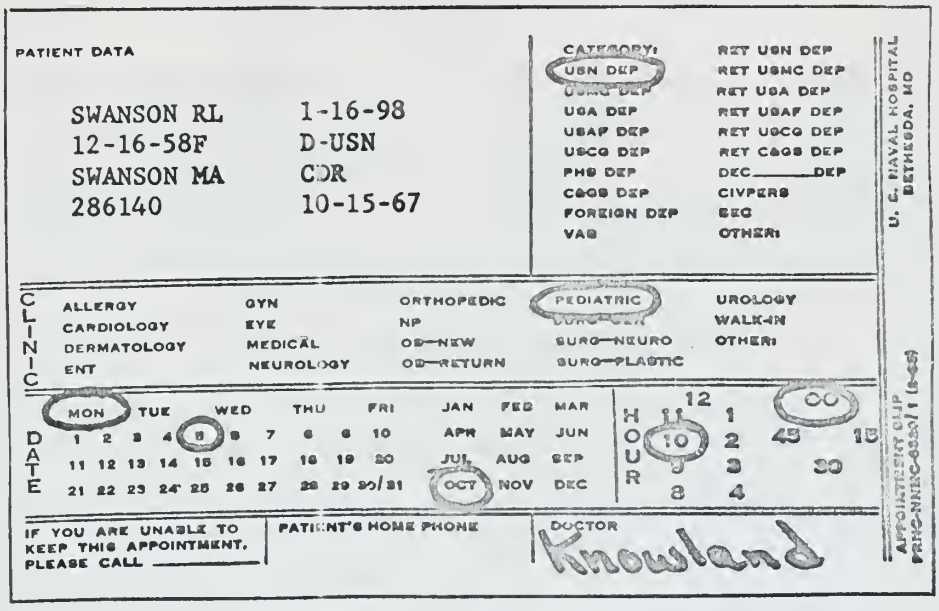

Fig. 4.--Patient appointment slip

Each patient who presents himself to the naval hospital outpatient department for treatment is issued a plastic patient recording card as illustrated in figure 5. This card is similar in appearance to most of the gasoline credit cards issued by many of the major oil corporations. Embossed on the card is the following information: name of patient; birth date; sex;

sponsor's name--that is the name of the active duty military member or retired member who establishes eligibility for his dependent; outpatient record number; status of patient--active duty, dependent, or retired; sponsor's rank; date card expires. This card is utilized with an imprinter to print the above information on the appointment slip.

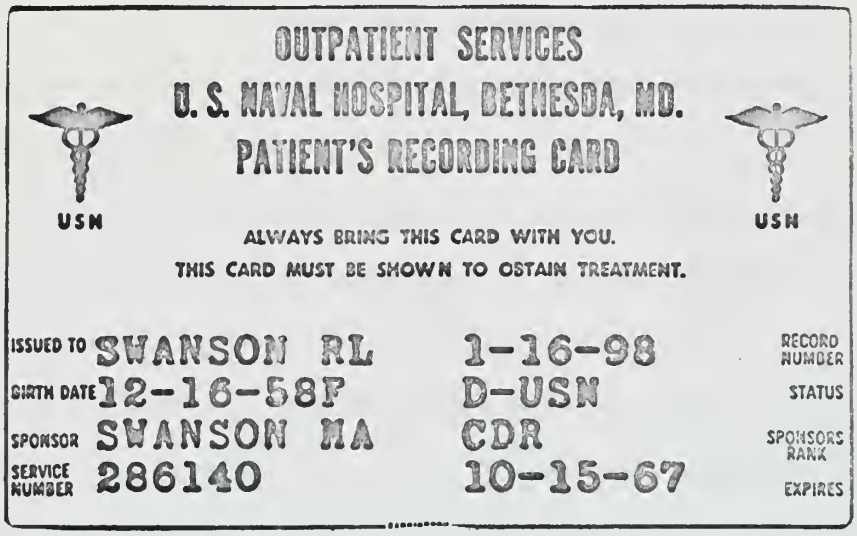
OUTPATIENT SERVICES
U. S. NAVAL HOSPITAL, BETHESDA, MD.
PATIENT'S RECORDING CARD
USN
USN
ALWAYS BRING THIS CARD WITH YOU.
THIS CARD MUST BE SHOWN TO OBTAIN TREATMENT.
ISSUED TO SWANSON RL 1-16-98 RECORD NUMBER
BIRTH DATE 12-16-58F D-USN STATUS
SPONSOR SWANSON MA CDR SPONSORS RANK
SERVICE NUMBER 286140 10-15-67 EXPIRES

Fig. 5.--Patient recording card

In the event the appointment is made over the telephone or by mail, the information that is contained on the patient recording card is printed on the appointment slip by the clerk.

In all cases the clerk encircles by hand the following on the appointment slip: (1) category of patient--USN Dependent, USMC Dependent; USA dependent, for example; (2) name of clinic in which appointment is made; (3) day of week, date, and month appointment is made; and (4) hour of appointment.

When the appointment is made in person, the original white copy of the appointment slip is handed to the patient as a reminder. If the appointment

is made by phone, the white copy is thrown away. If the appointment is requested by mail, the white copy is enclosed with the reply. The remaining three copies of the appointment slip are filed by the clerk in a small box in appointment date sequence.

The embossed patient identification card has other uses as well as imprinting information on the appointment slip. It is used to imprint patient identification data on laboratory and radiology forms and other component forms of the outpatient medical record. This insures that all studies will be filed in the proper outpatient jacket.

The number of appointments each appointment clerk can process in one day varies with each clerk. It also depends on the information solicited from the patient and the mode of communication utilized.

Each appointment clerk averages seventy in-person appointments and eighty telephone appointments per day.[1] It has been determined that the clerks spend from thirty seconds to three minutes, a range of two and one-half minutes, in the entire appointment-making process.[2]

Outpatient records are made available for each clinic on the night before the following day's appointment. The green copy of the appointment slip is used to select the appropriate records from the medical record file room. The green copy is then inserted in an outguide folder on the file shelf to indicate to which clinic the record has been forwarded. After all records for a particular clinic have been assembled, they are sent to the respective clinic. Included with the records is the appointment card which the clerk has previously prepared for each doctor. This appointment card is used in two ways by the clinic. First, it permits the doctor to quickly

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[1] Ibid., p. 69.

[2] Ibid.

review his patient load for the day. Second, it can be used by the clinic nurse as a check-off list as each patient presents himself for his appointment. Also included in each record is the pink copy of the appointment slip which serves no practical purpose. This copy of the appointment set may be eliminated at some future date.[1]

This appointment system has been most successful since its inception in 1963. Its main advantage is the fact that all appointments are made from a single location. It eliminates the necessity of patients visiting or phoning individual clinics. Thus, the clinic can confine itself to patient care activities.

Discussion of Records Handling System

Each patient on his first visit to the outpatient department is issued a patient's recording card as discussed in the previous section. The patient is required to register once and only once to get into the record system. Once an outpatient record number is assigned, it always belongs to the patient even if he leaves the Bethesda area and returns some years hence.

All outpatient clinical records are filed in one location utilizing open shelf filing. The file room is adjacent to the central appointment desk.

Records are filed utilizing the Remington Rand terminal digit filing system. The mechanics of the system are quite simple. Basically, there are one hundred numbers from 00 through 99. If, for example, there are one hundred shelves in the file room, each shelf is assigned a "terminal digit" number. The first shelf is numbered 00 and the last shelf is numbered 99. If we use the number 53 as an example, all folders with the "terminal" or final two

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[1]Interview with LCDR Butler.

digits ending in "53" would be filed on the shelf assigned to "53." Therefore, on this shelf there would be filed the following folders:

53
153
253
353
453
553
653, and so forth.

The outpatient jackets are pre-numbered. A number printed as 1-02-53 would belong to patient 10,253. The folders are numbered in two locations: at the top edge and near the bottom on the outside of the front flap. The purpose of this is so that top numbers can be scanned when looking at the center shelves downward and the lower numbers are visible when scanning on the upper shelves.

In addition to the pre-numbering of the jackets, each jacket is blocked and tinted to provide positive control. There are eleven block spaces. The terminal digits printed on the folders must agree with the corresponding numeric positions of the black blocks. For example, for any folder with the terminal digits 53, there is a black block in the number 5 position and another one in the number 3 position. In addition, the number 53 folder is tinted orange. It cannot be confused with folder number 35 which has blocks in the same places because folder number 35 is tinted green.

The combination of numbers, blocks, and tinting provides a positive control since all folders for a given terminal number have all blocks in the same position. Thus, one misfiled folder stands out from other folders since the blocks would not line up with the adjacent folders. Even if there were transposition of numbers (35 for 53), the green tinting on the 35 folder would stand out among the orange folders for 53.

The jackets are also additionally color-coded by the personnel of the outpatient department. Each calendar year a different color adhesive tape is affixed to the record when it is taken from the shelf and delivered to a particular clinic.[1] The purpose of this is to assist in retiring records which are not active. Patients may have moved from the area or for some reason are not utilizing the medical services of the outpatient department. The use of this color coding permits an annual scanning of all records to determine which records should be "pulled" and retired.

Although the mechanics of the terminal digit system contribute to efficiency in locating and filing records, there is the problem of entering manually information in the record. The physician who sees and examines the patient must enter his handwritten report in the record. A file clerk in the record room must insert the myriad of laboratory and x-ray reports and other forms into the record.

A study completed by the outpatient department revealed that each outpatient averaged four forms per visit, composed of laboratory procedures and x-ray requests, for example.[2] This average number per patient equates to between 7,000 and 8,000 forms per day that must be stapled or pasted in the records.[3]

For the most part, inserting documents into outpatient records is accomplished by six women assigned to the record room--one supervisor, GS-4, and five GS-3's. Thus, filing of forms in the record is a significant effort.

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[1]Interview with HMCM H. M. Marshall, USN, Outpatient Department, Naval Hospital, Bethesda, Md., November 14, 1969.

[2]Interview with HMCM Marshall, November 24, 1969.

[3]Ibid.

Filing must be kept current so that the record is complete for each appointment because the patient may not see the same physician on two consecutive visits.

Review of Outpatient Department Reporting System

There are two statistical reports prepared by the outpatient department. One is the Medical Services Report, NAVMED 1454, and the other is the Monthly Outpatient Clinic Report.[1] Both reports contain essentially the same information. They report monthly statistical data on both total number of outpatient visits as well as visits per individual clinic. The NAVMED 1454 is the more discrete of the two forms since it also reports visits by category of patients seen.

The NAVMED 1454 is an external report. It is prepared for the Bureau of Medicine and Surgery. Statistical information contained in the report is used for several purposes. The statistical workload derived from the Medical Services Report is the major determinant in the allocation of funds and the assignment of personnel. The report also plays an important role in planning for expansion of existing facilities.

The Monthly Outpatient Clinic Report is an internal report. It is distributed to the Commanding Officer of the Naval Hospital, Chiefs of Services, and to each clinic. It is a summary report indicating the workload of each clinic. Since it is primarily an informative report, it does not reflect various categories of patients. It reports total number of patients seen.

The source document for both reports is the yellow copy of the appointment slip. This copy is delivered at the end of the day to the statistical

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[1]Interview with LCDR Butler.

section of the outpatient department. There are two employees in this section who are responsible for preparing the monthly statistical reports. The reports are manually tabulated daily by this section and are summarized, typed, and distributed at the end of the month.

Occasionally, a patient is seen in a clinic without an appointment. A physician may have instructed a patient to return the following day for a reevaluation of his condition. This is generally done without scheduling an appointment. In cases such as this, it is the responsibility of the particular clinic to notify the statistical section of the number of patients and categories of each that were seen. This is to insure that all visits are contained in the monthly reports. Administrative officials of the outpatient department believe that all clinics accurately and faithfully report those patients who are seen without a formal appointment.[1] If these patients were not included, the report would not measure the actual outpatient workload. Each clinic chief, consciously or unconsciously, would like to impress upon others the volume of patients examined or treated. This workload is also the clinic chief's support for additional resources.

When completed, the Medical Services Report is forwarded to the Naval Medical Data Services Center for processing. All data on the report is keypunched and verified. It is then merged with other Medical Services Report data submitted by all other naval medical treatment facilities. This includes reports from ships with medical department personnel. The total number of reporting facilities that contribute data is approximately 1400.[2]

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[1] *Ibid.*

[2] Interview with Joseph Burke, III, Statistical Data Analyst, Naval Medical Data Services Center, National Naval Medical Center, Bethesda, Md., December 11, 1969.

All data are manipulated and reported in tabular form in selected formats to the Bureau of Medicine and Surgery. As previously mentioned, the information derived from the Medical Services Report is utilized in the decision-making process as it relates to the planning, programming, and budgeting system.

Summary

The "one-step" appointment system is convenient and time-saving to the patient. Clinic activities are confined to rendering patient care; administrative functions are minimized.

The terminal digit record filing system contributes to efficiency in locating and filing records.

There are two statistical reports prepared by the outpatient department. Data are manually collected and manipulated, and hospital authorities believe that the reports are accurately prepared.

CHAPTER III

CURRENT TRENDS IN AUTOMATING OUTPATIENT DEPARTMENTS

Introduction

Over eighty hospital functions can be computerized.[1] These range from the scheduling of linen distribution to the computer analysis of electrocardiograms. Most applications to be computerized in hospitals are business-oriented. Accounting, payroll and inventory control are typical examples. One reason for this is that hardware manufacturers have the requisite experience in the field and the software to accompany the experience.

Many computer applications have been instituted for the purpose of improving the efficiency and effectiveness of operating the outpatient department. Ohio State University Hospitals and Boston's Children's Hospital are two examples of civilian institutions which have adapted automatic data processing techniques to administrative functions. Fitzsimons Army Hospital in Denver, Colorado, is one of the few military hospitals which are utilizing the computer in the management of the outpatient department.

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[1] Iris M. Poliski, "EDP--First Aid for Hospitals," Business Automation, July, 1968, p. 35.

Each hospital will be examined and commented upon. In addition, the proposal to mechanize an outpatient reporting system in a naval hospital will be discussed.

Outpatient Department of the Ohio State University Hospitals, Columbus, Ohio

In the early and middle 1960's, the Ohio State University Hospitals were confronted with problems identical to those confronting many naval hospitals today. Hospital administrative personnel were being drowned in a paper sea of handwritten appointment lists. Clerks were required to hand-write medical record and x-ray sign-out slips and cards, copying names, numbers, and clinic names from an appointment slip.[1] This procedure resulted in numerous errors. Also, the Medical Record and Radiology Departments had to hand-sort cards and slips to fit the terminal digit filing system. In order to resolve these problems, the Ohio State University Hospitals developed a system that provided for printed clinic appointment listings and sign-out cards for the Medical Record and Radiology Departments.[2]

When a new patient arrives at the clinic, he is given an interview and assigned a number. He is provided a plastic addressograph card for embossing all forms. The card contains the necessary sociological data concerning the patient, information concerning his method of payment, as well as his name, patient number, and home address.

The patient is then referred to a screening clinic where his medical problem is determined and he is treated. If a future appointment is needed,

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[1]David J. Pae, "Organizing Outpatients to Cure Clinic Chaos," Medical Record News, April, 1967, pp. 117-118.

[2]Ibid., pp. 118-121.

he is then sent to the Central Appointment Department. A two-copy appointment slip is made, and he is given one copy. The other copy goes to data processing and is keypunched. From these data are produced the listings and packets shown on the bottom line of figure 6.

A packet of voucher cards is pre-punched for each patient with a future appointment. Each day the packets are delivered to the Clinic Business Office for the following day's clinic appointments.

Appointment listings are sent to the Central Appointments Department each day. These lists are used in scheduling future appointments to avoid overbooking.

Each clinic gets a listing of its own appointments one day in advance. A complete appointment listing containing a full ten-day schedule is sent to the Medical Record Department.

A packet of punch cards is sent to the Medical Record Department two days before the date the records will be needed. They contain the patient's name, clinic, date of appointment, and hospital number. These cards are already sorted in terminal digit order and are used to sign out the records from file. The medical records are then delivered to the clinics. When the records are returned, the out-cards are pulled and the punch cards are destroyed.

A packet of similar cards is sent to the Radiology Department and used in the same way for signing out x-rays.

When the patient arrives on his appointed day, he picks up the pre-punched packet of voucher cards at the Central Appointment Desk and proceeds to the clinic for treatment. There his name is checked on the appointment

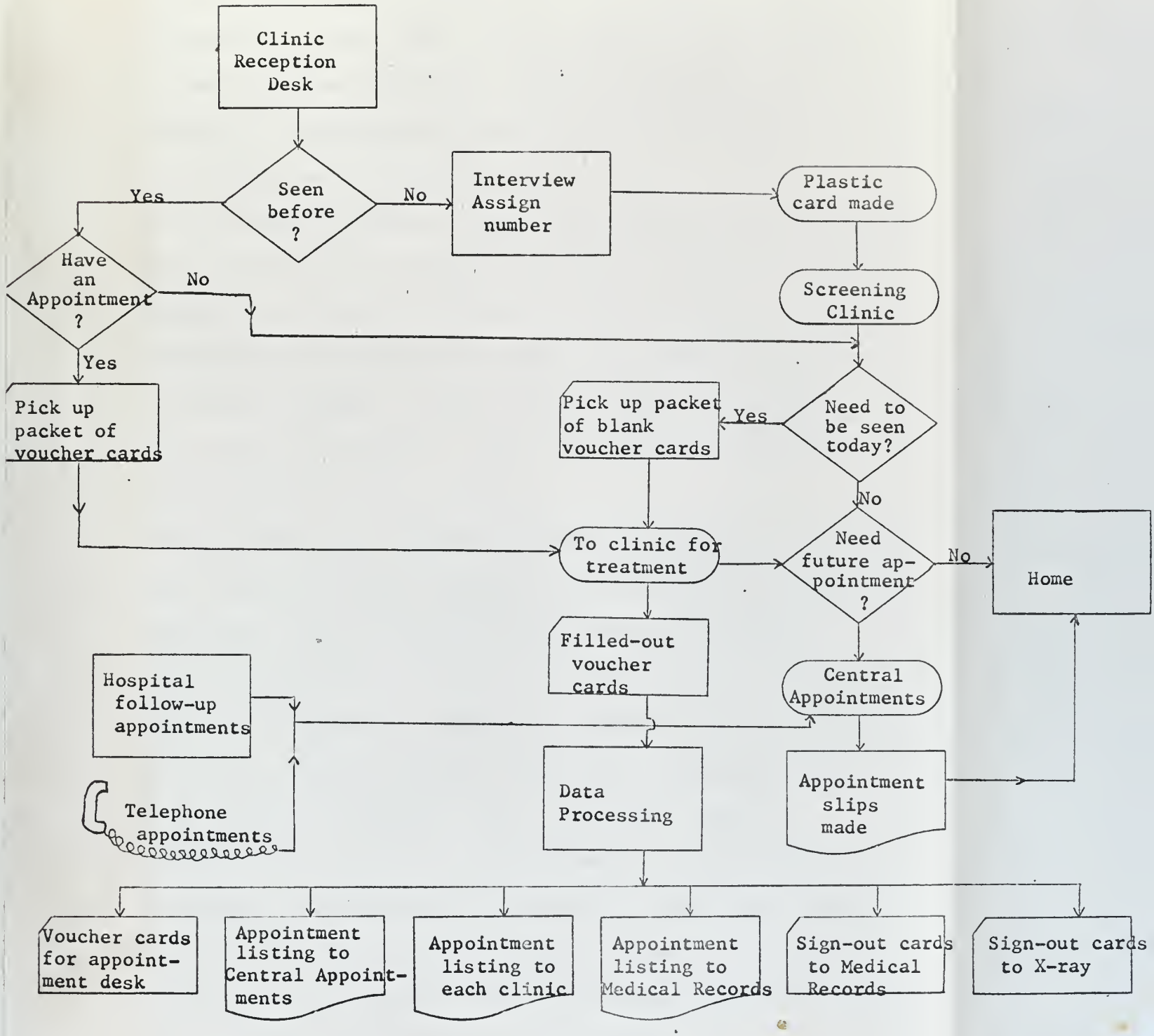

Fig. 6.--System flow chart

listing for that day, treatment is given, and recorded in the medical record. A card is then marked with the cost of treatment. If the patient receives treatment in a laboratory or other service area, a card is marked there also with the cost. These cards are then taken to data processing at the end of the day. The amounts of the charges are punched in, the cards processed, and the data used for billing and accounting purposes.

Hospital inpatients scheduled for clinic follow-up obtain an appointment slip on the nursing station before discharge. One copy of this slip also goes to data processing where it becomes a part of the clinic appointment system. Telephone appointments are made through the Central Appointments Department.

Walk-in patients are given a packet of blank voucher cards and sent to the appropriate clinic for treatment. Cards are marked with the cost of treatment and also delivered to data processing.

The Ohio State University Hospitals' Outpatient Department has realized certain advantages from this system.[1] Patient data are stored in a computer file so that misspellings and wrong identification numbers are gradually eliminated. Central Appointments receives printed listings well in advance of patients' visits. The system has eliminated the necessity for handwritten requests and provided an efficient procedure for medical records and x-ray sign-outs. It has provided the hospital with a considerable amount of computer-stored data on its outpatient population that the hospital hopes to use in the near future. The Medical Record Department no longer has to hand-sort 400 to 500 cards a day, many with wrong numbers. Finally, the doctors in the clinics were impressed with the efficiency of the Medical Record and Radiology Departments in quickly providing the required records.

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[1] Ibid., p. 121.

Outpatient Clinic Scheduling System, Children's Hospital Medical Center, Boston, Massachusetts

Children's Hospital opened its outpatient facility in September, 1967. For the first time, all fifty-four clinics were consolidated into one structure. Like most other hospitals, Children's had caused both outpatients and parents to suffer with "poorly planned facilities, haphazard scheduling, and general inefficiency." Clinic operations were becoming buried in mounds of paper work. Appointment clerks had a difficult time scheduling the 2,800 patients that visited its various clinics each week.[1] It was evident that greater efficiency in scheduling the patient appointments would result in a reduction of frustration among parents and clerks. Ultimately, it was envisioned that costs in the outpatient area would be reduced.

There was also concern about the continuity of care being rendered to the patient. Seldom was a child seen consecutively by the same physician. It became difficult to determine which physician was responsible for each patient. Each patient was therefore a patient of the institution rather than a patient of an individual physician.[2] While this practice may be acceptable in military medicine, it apparently is unacceptable to the civilian community.

A computer system was devised to solve the inherent problems. The major goal of the system was to put all outpatient scheduling on a computer with the capability of scheduling or canceling appointments in any of the clinics from any of the nine floors of the clinic building.

Secondary goals of the computer system included:

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[1] Leonard W. Cronkhite, Jr., M.D., "Computer Brings Order to Clinic Scheduling System," Hospitals, April 16, 1969, pp. 55-56.

[2] Ibid., p. 56.

Initiation of a master patient record in an on-line computer file, that could be queried from any remote terminal, for all active patients at the hospital.

Incorporation of the location of medical records and x-ray film folders into the on-line patient record control.

Scheduling of patients for any ancillary services needed and preparation of production orders for the departments rendering those services.

Storage of data by departments to enable a specific department to determine its schedule at any given time.

Developing of personnel scheduling in service departments to take into consideration available facilities, equipment, and personnel.[1]

In order to accomplish its mission and objectives, the hospital applied for and obtained a United States Public Health Service grant for $668,621 to partially defray the costs of designing and implementing the system.[2]

The clinic scheduling system consists of a central processor with a memory capacity of 65,536 characters, twelve cathode ray tube terminals with input keyboards, three teletypewriter printers, one high-speed 650-line-per-minute printer, three on-line disc pack drives with memory capacity of 9.2 million characters each, four magnetic tape drives, an 800-card-per-minute card reader, and a card punch.

The cathode ray tube terminals are located in various reception areas and administrative offices in the outpatient building. One of the teletypewriter printers is located in the medical records library. The other printers are in the main reception area and run parallel in the event one should break down.

Data needed for scheduling appointments is readily available in the memory banks of the computer. To aid in the appointment process, remote

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[1] Ibid.

[2] Ibid.

cathode ray tube terminals are strategically located throughout the clinic building. To illustrate this system, a clerk in the orthopedic clinic located on the second floor does not need to telephone the third floor surgical clinic to make a surgical appointment for a patient. Instead, the appointment clerk presses a "command" button on the cathode ray tube terminal's console for the next scheduled dates of the surgical clinic. Seconds later, the remote terminal displays the next forty dates. The clerk and patient agree upon a day that is convenient. The terminal then displays all the unbooked appointments for that particular day. An appointment time is selected by the patient. The clerk keys the patient's medical record number and appointment time and transmits this to the computer. The appointment process is complete.

The computer is also used for other purposes. At the end of each clinic day, it performs several tasks using the high speed printer and magnetic tapes. The computer makes a printed listing of all patients who have appointments on the next day. The list is forwarded to the clerk at the main reception desk located on the first floor. For each clinic operating the next day, the computer compiles a printout that contains each patient's name sequenced by appointment time and any information that may be pertinent for the physician or nurse. A listing of appointments two days in advance is prepared for the use of the medical records department. This is necessary for manually searching and retrieving medical records from the files. These records are shipped by conveyor belt to the appropriate floor.

The clerk at the main reception desk checks off each patient as he arrives for his appointment against the listing provided. He is then directed to the proper floor for his appointment. After the patient has been examined, subsequent appointments are made in the same fashion as previously described.

The computer also maintains an index on patients who are actively using the clinic. This is a 200-character locator file containing the patient's name, medical record number, birth date, sex, religion, and other pertinent information such as his financial category and appointment record.[1]

The remote terminal has an input keyboard with numeral and letter keys and a row of "command" function buttons. To begin an index record, the clerk presses a button marked "admit" and then types in the available data on the patient. The information appears on the cathode ray display tube as it is typed in. When the typing is completed, the clerk presses the transmit button. The computer accepts the information and displays it back on the display screen along with a record number that becomes a permanent part of the patient's file. When the patient arrives for an appointment, the clerk presses the "inquiry" button and keys in the proper record number. The patient's index record is displayed on the cathode ray tube with blanks in the event certain information is missing. The clerk presses the "update" button and types in the information to fill in the blank spaces. Once the file is complete and visually checked by the clerk, the "transmit" button is depressed.

If an error has been entered into the system, for example, if sex is coded "C" instead of "M" or "F", the computer will not accept the error. Instead, it will note at the bottom of the display tube that an error has been made regarding the patient's sex. The necessary correction can then be keyed in.

Children's Hospital has nine on-line functions programmed for the remote terminals. They include admitting, updating, making an appointment,

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[1] Ibid., pp. 56-57.

canceling a clinic session, inquiring, medical record requesting, attendance, and schedule changes.

Each of the units has direct access on-line to the computer. However, control of what goes into the computer is maintained in several ways. For example, the function of the various units is limited--an index record can be created only at the main reception desk and a change in a medical record number can be made only in the medical record library.

The input-output terminals are connected to the computer by cable. When the "transmit" button of the display unit is activated, the data goes into the central processor. If the computer is performing a job, it goes into an "interrupt" routine, accepts the new data, stores them in a buffer, and completes the current job. Then it takes the new data from the buffer for processing.[1]

This computerized outpatient scheduling system is a part of what Children's Hospital hopes will be a total information system, integrating all the hospital's medical, statistical, and financial data. Children's Hospital has put into service the nation's first computerized patient location control system and was able to use experiences and personnel from this effort in the clinic scheduling system.

Mechanized Appointment System, Fitzsimons General Hospital (U.S. Army), Denver, Colorado

As is true with most military hospitals, Fitzsimons General Hospital experiences an ever-increasing number of outpatient clinic visits. In 1964, the number of clinic visits exceeded 417,000. The number of clinic visits

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[1] Ibid.

has been increasing each year since World War II, and indications are that this trend will continue.[1]

In 1963, hospital authorities were well aware of increasing workloads and began to plan for a better method of making appointments and managing clinic statistics at the Fitzsimons Hospital. They needed a system which would afford a high degree of accuracy because in military hospitals, personnel and financial resources are allocated on the basis of workload. They hoped to design a system which would expedite records from the central record repository to the clinic where the appointment is made. Hospital officials also wanted a simpler and less expensive method of depicting outpatient statistics.

A mechanized central appointment and accounting system was proposed to solve these problems. As can be expected, many objections were set forth by hospital personnel as to why such a system would not work. Some individuals suggested that there would be an increased number of errors in the clinic schedules. Others voiced the opinion that clerks would develop indifferent attitudes toward patients. More subtle than the latter objections but at least equal in importance was the fear that clinics would suffer a loss of personnel.[2]

Through strong leadership and good salesmanship, centralization at Fitzsimons General Hospital began in 1963 with appointments for the general outpatient clinic. Applications were mechanized utilizing the automatic data processing equipment already installed. However, this system has since been converted to a later model computer. Gradually, thirteen other clinics were phased into the system on a voluntary basis. Clerks at the appointment

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[1]LT COL Isabel S. Paulson, ANC, "A Mechanized Outpatient System for Outpatient Clinics," Hospitals, September, 1966, p. 80.

[2]Ibid.

desk have the responsibility for keypunching the appointment record cards for the clinics.

Simple operating procedures were developed to produce a functional system for scheduling appointments. First, the head of each clinic determined the clinic's capability of accepting patients. The following information was incorporated into the standard operating procedures of the central appointment desk.

1. The days and hours the clinic would be in operation.

2. The names of physicians who would be available for clinic appointments on specific days and at specific times.

3. How far in advance appointments could be made.

4. The interval of time specific clinics desired to allot to patients with appointments or to specific types of cases.

5. Any specific instructions the department chief wished to convey to the appointment clerk concerning his clinic.[1], [2]

The necessary information was then forwarded to the data processing branch, where prepunched appointment cards were made for specific physicians in each clinic. The cards were printed to indicate the card control number, the specific physician code number, the hour of the appointment, day of the week and date, and the month and clinic code.

After the cards are punched and interpreted, they are returned by the data processing branch to the central appointment desk. They are filed until needed. The duration of storage depends upon how far in advance appointments can be made at each individual clinic. Each clinic has a certain location in

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[1] Ibid., p. 81.

[2] The standing operating procedures just described are identical to the procedures utilized by the Naval Hospital, Bethesda, Md., as outlined in the previous chapter.

the file and the cards are indexed in that location by each doctor's name and number and by the day and date the clinic will be in operation.[1]

Outpatient appointments at the Fitzsimons General Hospital are normally made by telephone either from the patient's home or the lobby of the hospital.[2] The phone call is made to the central appointment desk of the outpatient department. The patient usually requests to see a particular doctor. The clerk answering the call locates the file for the physician requested, and, in most cases, the clerk and the patient must reach an agreement regarding the date and time for the appointment. The clerk then writes in or encircles the information necessary to complete the card. Information such as patient name, sex, and patient classification is contained on each card. The card is then fully coded by a keypunch operator and filed in a closed appointment file.

The completed appointment record cards are forwarded to the data processing branch two days before the scheduled appointments. The data processing branch prepares two lists from the cards. One is an alphabetical listing of patients to be seen in each particular clinic. This list is used by the clinic as a check-off sheet for patients as they appear for appointments and to record "no shows" and cancellations. The second listing is designed for the individual physician. It contains the names of his patients for the day arranged in sequence according to the time of appointment. It is also used to place each patient's chart in appointment sequence. In addition to the two listings, the data processing branch reproduces a complete set of appointment cards. These cards are arranged in alphabetical sequence and forwarded to the central appointment desk. The cards are used to select the patients' records required

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[1]Paulsen, "Mechanized Outpatient System," pp. 81-82.

[2]This procedure differs from the practice in naval medical activities. Patients are required to make appointments in person by visiting the appointment desk or by telephoning for an appointment.

for each clinic on the following day. The card also serves as an "outguide" for each record removed from the files. In addition, they can be used by the file clerks to prepare records for new patients.

Customarily, there are patients who are seen in various clinics who do not have appointments. These patients must be included in the workload statistics if the reports are to be accurate. To account for the non-appointment patient, the clerk in each clinic encircles and writes in the necessary information on a card that has not been prepunched. At the end of each day, these cards are delivered to the central appointment desk where they are keypunched. At the end of each month, all completed cards are processed by the data processing branch, and an outpatient statistical report is produced. The report is prepared in the format required by the Department of the Army.

"No shows" and "cancellations" are keypunched on a control card so that these appointment cards can be removed from the files.[1] This insures that the statistical data are correct. A listing can also be prepared of those individuals canceling or not keeping appointments.

This mechanized system has many advantages that would be beneficial in many hospitals as well as at Fitzsimons General Hospital. First, it provides a simple procedure for gathering statistics for accurate outpatient reporting. It cannot be overemphasized that this report must be accurate because it is the single document which can be used to justify resources. Secondly, errors are kept to a minimum because the cards are keypunched centrally. If, for example, cards were mark-sensed at individual clinics, many errors would result and require correction. A third advantage is the

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[1]Paulsen, "Mechanized Outpatient System," pp. 82-83.

time saved in the patient record file room. Since the cards are arranged alphabetically for the clerks, minimal time is required to locate the necessary records. Finally, clinic clerks do not have to concern themselves with making appointments. They can devote more time in actively assisting the doctor in direct patient care. This is an important benefit of the central appointment system.

An accurate and reliable statistical count is the major advantage of this system because of the implications on manpower, money, and space for the department's operations. It is exceedingly difficult for higher authority to rebut an increase in resources if the statistics are accurate.

The centralization and mechanization of clinic appointments have been accepted by those clinics utilizing the system.[1] Apparently, the excellent results of this system were visible to the staff members, and their early fears proved to be unfounded.

Mechanization of Outpatient Report System Devised by the Bureau of Medicine and Surgery

The Bureau of Medicine and Surgery developed a system for the mechanical collection of outpatient workload data at naval hospitals. Its purpose was to adopt a standard mechanized system for collecting and reporting outpatient workload data.[2] Prior to developing this system there had been an increase in the number of outpatient visits to hospitals and a decline in the inpatient workload. However, funds for the operation and maintenance of hospitals were computed and justified on estimated cost per inpatient day. To compensate for the decreasing inpatient workload, a more detailed measure of

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[1] Ibid., p. 88.

[2] Interview with LCDR Francis X. Faherty, MSC, USN, Assistant Director, Naval Medical Data Services Center, National Naval Medical Center, Bethesda, Md., January 15, 1970.

the outpatient workload had to be obtained to provide more data from which to determine the cost of the outpatient medical care function. It was decided to promulgate standard procedures for mechanizing the collecting and reporting of outpatient workload data. This would insure greater accuracy and uniformity in the workload data submitted, standardization and simplification of the collection and tabulation of large volumes of data, and finally, saving in man hours by reduction in the time required to prepare the report by manual means.[1]

The proposed mechanized reporting system measured the workload of each clinic, emergency room, or service providing care to outpatients. The system also measured the outpatient and inpatient workload of adjunct services, such as the laboratory, radiology, pharmacy, and the physical and occupational therapy units.

The proposed reporting system used five mark-sense machine tabulating cards. One card was designed to be used in the clinics and emergency room, and the other cards were designed to accommodate the laboratory, radiology service, pharmacy service, and physical and occupational therapy units.

The cards were designed to measure and report all the data required by the Bureau of Medicine and Surgery in support of budget and staffing requirements. The cards were to be marked at each clinic or service area by type of service(s) rendered. Patients were identified by category; i.e., active duty Navy, Marine Corps, or dependent Navy or Marine Corps. The marked-sense cards would be read by machine, and types of services tallied or converted to IBM punch cards for use in preparing the monthly outpatient data

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[1]Interview with LCDR R. W. Horrobin, MSC, USN, Chief, Fiscal and Supply Division, Naval Hospital, Orlando, Fla., January 29, 1970.

report. The uniform and accurate data would then be weighted to determine the relative cost of the various services provided.[1]

It was proposed to pilot test the reporting system at two naval hospitals for a period of ninety days. It was rightfully anticipated that a system as complex as this must first be tested and "de-bugged" before it could be implemented by numerous activities.

The proposed collecting and reporting procedures were comprehensive and well developed. A considerable number of man hours went into the preparation of the system. However, it was not undertaken on a pilot basis for various reasons.[2] One quite apparent reason was the use of mark sensing. Even though it offered an easy method of collecting data, it required the marking of a considerable number of columns. The system contained a high probability of error in coding. The chance of error was further increased by personnel changes in the clinic and service areas. There were a number of other objections to the proposal, but suffice it to say that the system as proposed was not accepted. Thus, the Navy retained the manual method of tabulating and reporting statistical information from its outpatient clinics.

Summary

In order to resolve problems associated with handwritten appointment lists, the Ohio State University Hospitals developed a system that provided printed clinic appointment listings and sign-out cards for the Medical Record and Radiology Departments. The computer system that was developed solved these problems in a satisfactory manner.

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[1]Interview with LT Jack G. Fullerton, MSC, USN, Chief, Systems Division, Naval Medical Data Services Center, National Naval Medical Center, Bethesda, Md., January 15, 1970.

[2]Interview with Joseph Burke, III, Statistical Data Analyst, Naval Medical Data Services Center, National Naval Medical Center, Bethesda, Md., January 15, 1970.

Children's Hospital in 1967, aware that greater efficiency in scheduling patient appointments was required, developed a computer system to solve this and other problems. The clinic scheduling system consists of a central processor with cathode ray tube input-output terminals. Nine on-line functions are programmed. They include admitting, updating, making an appointment, canceling a clinic session, inquiring, medical record requesting, attendance, and schedule changes.

In 1963, because of increasing workload, Fitzsimons Army Hospital began to plan for a better method of making appointments and managing statistics. A mechanized central appointment and accounting system was developed to solve these problems. The system has many advantages. First, it provides a simple procedure for gathering statistics. Secondly, errors are kept to a minimum because the cards are keypunched centrally. A third advantage is the time saved in the patient record file room. Finally, clinic clerks can devote more time to actively assisting the doctor in direct patient care and do not have to concern themselves with making appointments.

The Bureau of Medicine and Surgery developed a system for the mechanical collection of outpatient workload data for naval hospitals. Although the system was well developed, it was not instituted for various reasons. Thus, the Navy retained the manual method of tabulating and reporting statistical information from its outpatient clinics.

CHAPTER IV

THE MEDICAL RECORD AND THE COMPUTER

Introduction

One of the main concerns of those interested in hospital paper work is the medical record. Clinical record information is gathered and recorded primarily to enhance patient care. Such information also constitutes valuable research data, but its inaccessibility due to the limitations of present conventional filing systems generally has precluded its extensive use for this purpose.[1] Dr. Jan Polissar contends that the main purposes of the medical record are: "(1) to provide a focal point at which information about the patient can be collected and made available for review, and (2) to provide an accessory memory for the physician and support staff."[2] He believes that the first function can be performed by the computer but that the "hard" patient record that one can hold in the hand will continue to perform the second function.

In this chapter some of the efforts that have been made in automating the medical record will be examined. This chapter will conclude with a discussion of the legal implications that must be considered in changing from a manual recording system to the computer.

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[1]Richard D. Yoder, M.D., "Preparing Medical Record Data for Computer Processing," Hospitals, August, 1966, p. 75.

[2]Jan Polissar, M.D., "Hospital Computer Applications: Possible and Projected," Hospital Topics, April, 1969, p. 40.

Automating the Medical Record

Several groups have made important contributions to the development of systems for automatic medical record keeping. As simple as it may appear, the task of automating the preparation of medical documents is plagued with difficulties because of a variety of origins and purposes, and because many persons contribute data to the medical record. Traditionally the medical record consists of:

1. A face sheet with basic patient information data and chronological information for hospital usage (e.g., date of admission, date of discharge).

2. The initial history and physical examination written by one or several physicians attending the patient. The document is presented in a narrative form with a complex organization and is full of syntactic idiosyncrasies.

3. The clinical observations made throughout the patient's treatment.

4. Doctors' orders, usually precise in context and in chronology.

5. Consultation reports comparable to the medical history from an information processing point of view, but containing also judgments and therapeutic recommendations.

6. Laboratory data and results of functional tests (e.g., electrocardiogram, pulmonary function studies). The laboratory data are usually numerical and easy to process by computer. The functional testing data are complex and difficult to process because they are derived from analog records.

7. Special reports (e.g., radiotherapy, physical therapy).

8. A chronological account of patient's visits and progress notes with indications of treatments provided.[1]

Some work has been accomplished in the filing and retrieval of medical history and physical examination data. However, most of the systems already developed are unwieldy because data acquisition is made by a checklist.

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[1]Carlos Vallbona, M.D., "Application of Computers For Hospital Usage," Journal of Chronic Diseases, April, 1966, pp. 462-463.

Kaiser Foundation Hospitals have developed and utilize special source documents of the checklist type for medical history and physical examination.[1] More than 125,000 examination records already have been stored on magnetic tape.[2] These records form a data base which contains most forms of medical information, including patient histories and physical examinations; laboratory, electrocardiogram, and x-ray reports. These computer-stored patient records have a fixed field and fixed format structure which was economical to program and also permitted rapid storage and retrieval of the specific data stored for any single examination. However, the fixed field, fixed format file does not allow for storage of additional unscheduled data.[3] It is also difficult to integrate multiple examinations for a single patient in a manner useful to the physician. This method imposes serious restrictions on the physician at the time of taking the medical history, and it loses the meaning conveyed by the physician's or patient's own words.[4]

Schenthal and others describe a system which employs magnetic tape information storage and a new type of self-encoding form. The system was tested and found satisfactory on more than 2,000 outpatient records in eight clinical specialties. The system accepts the English language, produces a clinically usable printed record on standard size paper and provides direct computer access to the information for selection and scientific processing.[5]

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[1]Carlos Vallbona, M.D., "Preparing Medical Record Data For Computer Processing," Hospitals, August, 1967, p. 114.

[2]Lou S. Davis, et.al., "Computer-Stored Medical Record," Computers and Biomedical Research, May, 1968, pp. 452-453.

[3]Ibid., p. 453.

[4]Vallbona, "Application of Computers For Hospital Usage," p. 463.

[5]Joseph E. Schenthal, M.D., et.al., "Clinical Application of Electronic Data Processing Apparatus, III. System For Processing of Medical Records," The Journal of American Medical Association, October, 1963, pp. 101-105.

The computer used for this system has 40,000 characters of core memory, seven magnetic tape drives, a card reader and card punch, and a 600-line-per-minute printer.[1]

To record information for this system, a physician marks those items on the check list which pertain to his patient. If the appropriate item is not in the check list, he may enter it in the English language. Output for clinical use is essentially a duplicate of those items of the check list which the physician considered applicable to the patient and includes the quantitative and English language entries. Information is stored on magnetic tape at a density of 556 characters per inch.[2] The system utilizes variable length records and variable fields within records so that storage space is not reserved for items which were, for one reason or another, not recorded.

Automation of medical records is not a simple, straightforward task, partly due to the character of the information itself. For example, a patient easily may have both a myocardial infarction and a hernia. From this, one may deduce that most items of information are not mutually exclusive. Also, different clinical interests impose difficult record requirements. An ophthalmologist will record more information pertaining to eyes in greater detail than will a cardiologist. Furthermore, scientific and clinical use requirements impose two major processing requirements on the system instead of one.

Record requirements in clinical medicine vary widely according to the type of record involved. Laboratory reports may be short and concise, whereas clinical history and physical examinations are much longer and cover a wider range of subjects. Thus, "...because of the extreme variability in records,

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[1] Ibid., p. 103.

[2] Ibid.

considerable experience with the system will be required to evaluate actual machine and personnel requirements and configurations for specific applications."[1]

Korein and associates describe a system of computer processing of medical data utilizing the variable-field-length format. The writers describe a project utilizing this format which was undertaken at the New York University Division of Bellevue Medical Center.[2] All patients discharged had summaries written by the resident. The format designed was similar to the routine discharge summary. The initial part of the summary is the only fixed-field-length section of the format. It contains general and statistical information which identifies the summary. This portion of the record includes such general items as name of hospital, name and age of patient, and hospital number.

The variable-field-length part of the summary is divided into paragraphs of three orders. The first-order paragraphs list the major categories of data required. Within each first-order paragraph another fixed set of second-order paragraphs is present. The first- and second-order paragraphs are labeled or coded, but it is not required that the physician memorize the code. They are required for computer identification only.

Within each second-order paragraph there may be any number of third-order paragraphs. Within these paragraphs there is no limit to the amount of alphabetic or numerical information that may be included. The steps in the utilization of this method are as follows: (1) a set of instructions is given to the physician dictating the summary. These instructions indicate which information belongs in first- and second-order paragraphs; (2) the secretary has a similar set of instructions so she can type the report in the specific

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[1] Ibid., p. 105.

[2] Julius Korein, M.D., et.al., "Computer Processing of Medical Data By Variable-Field-Length Format," The Journal of American Medical Association, October, 1963, pp. 132-138.

format with appropriate code labels; (3) after the report is typed, it must be edited by medical personnel for medical, spelling, grammatical, and format errors; and (4) the report must be put into a suitable form that can be utilized for input into the computer.

Simple programs have been written for selecting data from the summary. However, the writers state that as more sophisticated problems arise, complex programming will be required. But before the latter is accomplished, language translation problems must be resolved.

Payne describes an interesting concept for automating medical record data. He recognizes that a complete set of medical notes on any particular patient is a pretty heterogeneous collection. Some parts lend themselves readily to automation, others do not. It is important to make a clear distinction between the two parts if any progress is to be made. He distinguishes between the two types of data simply as Class I and Class II data.

Class I data includes patient's number, age, sex, married status, occupation, blood groups, allergies, vaccines (types, doses, dates), the results of chemical/pathological tests, radiology (date and site), diagnostic categories, morbidity categories, operation categories, anesthetic agents, and so on. This data can be efficiently and economically stored, searched and analyzed by computer methods.

Class II data refers to doctors' notes, radiographs, electroencephalograms, electromyograms, and so on. A single sentence of a doctor's note would occupy as much electronic storage space in a computer as about one hundred items of Class I data, and this fact rules it out on economic grounds as a general practice.[1]

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[1]L. C. Payne, An Introduction to Medical Automation (Philadelphia Toronto: J. B. Lippincott Co., 1966), pp. 14-32.

To automate a doctor's note, the writer states, all one needs to do is store it compactly and retrieve it quickly. Continuous microfilm or video-tape would do this satisfactorily as well as more economically than a computer. It would also preserve exactly the original handwritten style of the record. The writer sees the medical computer installations of the future as ones which will automatically activate not only the digital magnetic tape files for the Class I data but also continuous microfilm and/or video-tape files as well. In the latter two cases, the computer's role will be confined to selecting a particular reel of microfilm or video-tape; searching it for the location of particular "notes"; and positioning this section for closed-circuit television transmission.[1]

Similar methods can be used for dealing with radiographs, electroencephalograms and other types of Class II data. The writer believes that automation of the entire record is certainly practical provided different methods are used to treat Class I and Class II data.

The fundamental distinction between Class I and Class II data is that the former is enumerable and the latter is innumerable.[2] For example, a patient's blood pressure is finite and can be enumerated. On the other hand, the possible number of doctor's notes is innumerable rather than enumerable. Few doctors, if any, would accept choosing from a pre-set list of enumerated sentences in place of a doctor's note. Few doctors would accept assigning a category number to a radiograph as a replacement for it. Some physicians would probably maintain that electroencephalograms and electrocardiograms can

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[1] Ibid., p. 27.

[2] Ibid., p. 28

be classified. But, not every doctor would accept another's classification. Only if agreement of this sort becomes possible will they acquire a Class I specification and be so treated.

Broadly speaking, the "art and individuality of clinical medicine" makes up Class II data; the more "scientific and universally verifiable part of medicine" is embodied in Class I data.[1]

The writer believes that it is evident that computers have an essential role to play in the application of automation to medical records. What this role is can only be determined by asking what parts of medical records procedures are worth automating, to what extent they are feasible and practical, and, above all, whether it would make sense economically.

Levy, Cammorn, and Smith describe the utilization of a medium-size digital computer to improve the quality, consistency, and legibility of patients' records in an ambulatory diabetes clinic of University Hospitals of Cleveland.[2]

The system utilizes the fixed-field method by marking the appropriate box on the input form for abnormalities. Cards are punched from these forms. The data are then transferred to magnetic tape for storage. Later, the tape is fed into the computer's memory, where the data are manipulated for output requirements. Abnormalities not listed on the input form are described in English by the physician. It is also transferred onto punched cards and stored with the rest of the patient's data.

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[1] Ibid.

[2] Richard P. Levy, M.D., Maxine R. Cammorn, M.D., and Michael J. Smith, "Computer Handling of Ambulatory Clinic Records," The Journal of American Medical Association, December, 1964, p. 77.

Programs were written to transfer the information on punched cards to assigned locations on the magnetic tapes. Other programs were written to provide the written reports.[1]

When laboratory tests are reported to the clinic, a clerk transcribes them onto the appropriate form for subsequent transfer to punched cards. This information is added to the magnetic tape file.

The total cost of the system was estimated at $2.00 per patient visit. This does not include the costs of designing the system and writing and "debugging" approximately 18,000 individual computer instructions that were needed.

The printed report contains information calculated by the computer, as well as data transcribed from the input forms.

The reaction of the physicians participating in the care of patients was generally one of enthusiasm. Physicians felt that the legible, regular format of the record was worth the nuisance of completing a form rather than scribbling in a conventional record. A few physicians expressed resentment toward the new system and did not believe it was worth their time to use the required forms.[2]

Legal Aspects of Automated Medical Records

A medical record system is affected and controlled by the operation of a variety of statutes and regulations applicable to hospitals and other institutions which deliver health care services. A change in the manner of storing, handling, and retrieving medical information has important medical-legal implications.

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[1] Ibid., p. 78.

[2] Ibid., pp. 79-80.

Every medical record system, whether manual or mechanical, should be secure and reliable. The most secure and protected system is worthless if the information is unreliable or inaccurate. Yet, the most accurate and reliable system is worthless if there are inadequate protections against unwarranted disclosure, whether intentional or unintentional.[1]

As a general rule, the statute or regulation governing the licensure of hospitals specifies with varying degrees of precision the contents of the record.[2] In setting up an automated system, each institution should meet the highest standard which pertains to medical records. This standard would be constituted by the requirements of the Joint Commission on Accreditation of Hospitals combined with specific state requirements, if any, that differ from those of the Joint Commission. When setting up a new record system, it is essential to be certain that all applicable legal requirements relative to medical records are known.

Some state regulations require that the medical record be written. This requirement does not appear to pose a major obstacle to automation because the output would take the form of a printed record. Therefore, it is a written record. The implication of some regulations and the clear language of others indicate an intent that written means manually created. For example, the Maryland requirement reads in part as follows:

> Medical records shall be written or dictated only by the attending physician or intern. They shall be written in permanent ink (not pencil or ballpoint pen).[3]

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[1]Eric W. Springer, "From the Law: Automated Medical Record Systems--I," Medical Record News, February, 1968, p. 66.

[2]Ibid.

[3]Ibid., pp. 66-67.

Several other states have a similar requirement to the effect that records should be manually written by pen to be legal.

These provisions were promulgated before automatic data processing techniques were in common use and applied to hospital information processing. A regulation with that language, however, will have to be interpreted, modified, or amended, to include within its meaning the notation of electronic collection and recording of medical information.

The requirement that medical records be signed is critical to the creation of an automated medical record system designed to replace the conventional manual system. The requirement that records or medical abstracts be signed by a physician is primarily for the purpose of authenticity. The signature of a physician provides an assurance that the information in the records purports to be factual information. Another important reason for the signature is that responsibility for actions can be correctly placed, especially in the medico-jurisprudence sense.

The Joint Commission on Accreditation of Hospitals has promulgated specific standards with reference to signature requirements. It is the responsibility of the medical staff to insure that records are authenticated and signed by a licensed physician.[1] In addition, signed laboratory and radiology reports should be filed within the patient's record.[2] Thus, signature requirements pose a major problem to automating the medical record. Signatures are required not only for the record as a whole but also for particular items within the record.[3]

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[1]John R. McGibony, Principles of Hospital Administration, (New York: G. P. Putnam's Sons, 1969), p. 105.

[2]Ibid., p. 106.

[3]Eric W. Springer, "From the Law: Automated Medical Record Systems, Part II," Medical Record News, April, 1968, p. 31.

Until these regulations are changed, they must be obeyed. It seems unlikely, however, that the majority of the agencies will be willing to change existing regulations without some showing that the requirements of system reliability and system security will be met.[1]

It appears that the creation of an automated medical record system would have to complement the maintenance of a conventional manual system until the questions relating to writing and signature requirements are resolved. From a legal point of view, an automated system cannot, at the present time, fully replace manual systems.

Many people are of the opinion that the most significant problem related to the development of automated medical record systems is the problem of privacy. Protection of the confidentiality of information is a major continuing concern. However, the law is not so precisely defined on the question of protecting confidentiality. Few statutes or regulations specifically require that records remain confidential.[2] However, persons in the health profession have always had an understanding and appreciation of importance of confidentiality. And, in accordance with this feeling, ethical requirements have been stated in professional standards with some degree of specificity.[3] But, there are few legal guidelines to which one can refer in developing a set of protections of confidentiality in an automated medical record system.

Physicians, nurses, and other hospital personnel aware of the rules will continue to maintain high standards of care with respect to automated

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[1] Ibid.

[2] Eric W. Springer, "From the Law: Automated Medical Record Systems, Part III," Medical Record News, June, 1968, p. 36.

[3] Ibid.

records. However, the same requirements apply to persons who operate the machine system; that is, persons who are not health professionals. Data processing personnel stand in the same relationship to the patient and his information as do the personnel in the medical records department. Thus, the ethical standards which apply to medical record personnel should apply to data processing personnel.

The development of an automated system will impose a continuing responsibility of care in the disclosure of information to anyone who does not have a legitimate interest in such information. This would apply to all hospital personnel, including data processing personnel. The law may be passive in the case of privacy of the medical record, but the responsibility for the maintenance of this privacy will rest upon the health professionals and the engineers who create and implement the automated system.

Another legal implication that must be considered in automating medical records is the question of admissibility of records into evidence in courts of law.

Generally, trial courts receive testimonial evidence from witnesses who are sworn and subject to cross examination by counsel and the questions of the trial judge. Statements which are not sworn to or subject to cross examination are not admissible because they are a form of hearsay. The medical record is hearsay because it contains unsworn statements made outside of court at some time in the past and offered to prove the facts it reflects.[1]

There are exceptions to the hearsay rule which permit the introduction of business records. The medical record has traditionally been received into

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[1]Eric W. Springer, "From the Law: Automated Medical Record Systems, Part IV," Medical Record News, December, 1968, p. 53.

evidence as a business record. Thus, the manually created record is admissible as long as the court can be assured that the information "(1) was routinely gathered in the course of the business of the institution (that is, not created specifically for the purpose of trial), and (2) was recorded at or near the time the event took place."[1]

When a medical record is to be admitted into evidence, the custodian of the record testifies as to the manner in which the record was created, maintained, and protected. From the testimony the court is able to determine whether or not the safeguards and guarantees of trustworthiness are fulfilled.[2]

Essential to the admissibility of automated records is the question of authenticity. A custodian of a record usually testifies as to how a manual record was stored and protected and the manner by which words, notes, and signatures were placed on paper. This testimony is easily understood by the court. But testimony about input, storage, and retrieval of information is not that easily understood. Most juries and judges are not familiar with the concepts and practices of automatic data processing. Therefore, great care must be taken in explaining the steps involved in the operation of an automated medical record system so that the court can understand its nature.

Perhaps the data processing expert should present computer output to the court and then testify to its authenticity. The medical record librarian who traditionally accomplishes the task would be relieved of explaining the input, storage, and retrieval of data--an area in which she may have limited knowledge. In any event, it must be remembered that the record speaks for itself and will only be admitted into evidence based upon the rules applicable

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[1] Ibid.

[2] Ibid.

to admissibility. The custodian has the responsibility to provide testimony to the court which shows that the medical record is an authentic business record of the institution made in the routine course of business. Whoever testifies must be prepared to describe the routines and procedures for reporting, storing, retrieving, and safeguarding the information in the automated system.

If information from the medical record is disclosed without consent, the hospital could be held liable for such disclosure. The same principles which apply to manual systems would also apply to automated systems. That is, all persons who have contact with the medical record are subject to uphold the ethical standards for the disclosure of information. In addition, the hospital has to insure that the handling of information in an automated system provides for the same strict standards of accuracy and same completeness that the handling of records in the manual system requires.[1] The information must be accurate, the information must be readily accessible, and the information must be used.

Protections must be developed to provide for system reliability at the input, processing, and output stages as well as the use stage. The automated system must be devised so that the input, processing, and output of information do not inject errors.

It is also necessary to guard against the tendency to accept machine-generated information without question. The physician or nurse must apply the same standards of accuracy that are applied in the manual system.

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[1]Eric W. Springer, "From the Law: Automated Medical Record Systems, Part V," Medical Record News, January, 1969, p. 50.

Several groups have made important contributions to the development of systems for automatic medical record keeping. Fixed field and fixed format computer-stored records have been developed which, while economical to program, have some shortcomings. This method imposes restrictions on the physician because it requires the use of source documents of the checklist type. Variable-field-length records have been developed but these also have not proved to be completely satisfactory. The problem of language translation must be overcome before more complex programming can be accomplished. Payne's concept of distinguishing between types of data has much merit. Class I data can be efficiently and economically stored, searched and analyzed by computer methods because it is finite and can be enumerated. Class II data, such as doctors' handwritten notes, is innumerable. Since it cannot be computerized at this time, all one needs to do is store it compactly and retrieve it quickly. Continuous microfilm or video tape would do this satisfactorily as well as more economically than a computer.

State regulations and requirements of the Joint Commission on Accreditation of Hospitals impose obstacles to the computerized medical record. The requirement that medical records must be signed is critical to the creation of an automated medical record designed to replace the conventional manual system. Because of this requirement, from a legal point of view, an automated system cannot fully replace a manual system at the present time.

CHAPTER V

EFFECTIVENESS, COSTS, AND BENEFITS

Introduction

This chapter will examine the effectiveness of the existing outpatient system at the Naval Hospital, Bethesda. In addition, the costs of automating selected outpatient departments and the benefits realized will be discussed.

Effectiveness of Naval Hospital, Bethesda, Outpatient Department

A hospital differs from a manufacturing organization in that it has no output to measure. It cannot count the number of units produced during a particular time period and compare the number against a standard. The yardstick for measuring success of a hospital is often defined as determining the quality of care delivered to the patient. The quality of care is evaluated by the professional physician who rightfully believes he is the only one capable of making this decision. The standard of effectiveness may be abstract, but until, or if, one arrives that can be quantified, quality care is the accepted standard.

Personnel working in the outpatient department, Bethesda Naval Hospital, believe that the present appointment system is highly effective. The system

is well designed and administered. Its main advantage is the fact that all appointments are made from a single location. It eliminates the necessity of patients visiting or phoning individual clinics. The clinics experience no problem whatsoever with "no shows" for appointments. This can logically be attributed to the fact that appointments are difficult to obtain because of the demand. Once an appointment has been made, the patient can be expected to keep it. Clinic personnel, both physicians and nurses, are enthusiastic about the present system. It permits them to allocate more of their time to direct patient care and treatment rather than concern themselves with administrative details.[1]

The system used for statistical analysis is also effective when measured against the controls insituted by the department. Monthly, each clinic prepares a feeder report with total visits for that particular clinic. This report is delivered to the statistical section of the outpatient department and compared against the total visits that have been developed by the statistical section. The difference between both documents is considerably less than 1 percent.[2]

Costs per outpatient visit could not be calculated. Unfortunately, personnel at the National Naval Medical Center, Bethesda, and the Bureau of Medicine and Surgery were unable to define the costs of outpatient visits. This is understandable when the various elements that should be included in total costs are examined. For example, what percentage of the costs of the x-ray department, laboratory, and pharmacy should be charged to the outpatient department? These are only a few of the variables involved. Therefore, computing cost per outpatient visit is a complex matter. Additionally, the

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[1]Interview with LCDR R. C. Butler, MSC, USN, Administrative Assistant, Outpatient Department, Naval Hospital, Bethesda, Md., on March 25, 1970.

[2]Ibid.

outpatient department is not budgeted on cost per outpatient visit, but rather on functions and mission performed.[1]

Cost per patient visit would require detailed analysis to compute. It is considered that such an analysis would be of sufficient magnitude to justify a thesis in itself.

Planning and control functions of management are performed without the use of EDP equipment. The controls that are instituted adequately determine the efficiency of the department. At the present time, long-range planning for the department is carried out by the Bureau of Medicine and Surgery.

Costs and Benefits of Automated Outpatient Departments

The automated outpatient department at Fitzsimons Army Hospital experienced a cost of $18.44 per outpatient clinic visit for fiscal year 1969. In addition, the average cost for outpatient visits at hospitals of comparable size to Fitzsimons but not as specialized was $9.30 for the same fiscal year. Cost per clinic visit at Fitzsimons was not reduced when automation was introduced in 1963.[2] The costs of one hospital versus another are based upon the nature of the services performed. The outpatient visits at Fitzsimons are probably more costly because of the specialty type service performed. In comparison, cost per clinic visit at Madigan Army Hospital, Seattle, Washington, was $6.34 for fiscal year 1969.[3] The low cost of outpatient visits at Madigan

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[1]Interview with Mr. C. A. Decesaris, Deputy Comptroller, National Naval Medical Center, Bethesda, Maryland, on March 25, 1970.

[2]Interview with Mr. H. J. Smith, Review and Analysis Division, Office of the Comptroller, Office of The Surgeon General Army, Washington, D.C., on March 25, 1970.

[3]Ibid.

can be attributed to the fact that the majority of the patients examined and treated are healthy, young servicemen. Therefore, there is no need to perform specialty type procedures; cases that warrant special procedures are referred to hospitals such as Fitzsimons.

Automation of selected functions such as patient appointments and statistical analysis did not reduce costs to Fitzsimons Army Hospital as might have been expected. The benefits that did accrue to the hospital subsequent to automation were:

1. It provides a simple procedure for gathering statistics for an accurate outpatient report.

2. Errors are kept to a minimum because of the centralization of keypunching input cards.

3. The machine cards are used to locate patients' records in the record file room.

4. Clinic clerks are not concerned with making appointments but can devote more time to actively assisting the doctor in direct patient care.[1]

There were no reductions in personnel as a result of changing from a manual to an automated system.[2]

Children's Hospital has not experienced any cost reduction as a result of automating their outpatient department. The hospital does not have available any statistical evidence of improvement in the two major problem areas:

1. Reduction of the cost per patient due to more effective scheduling.

2. Improvement in the continuity of care by seeing the same doctor on multiple visits.

"On a subjective basis hospital personnel believe the automated system has definitely improved the efficiency and accuracy of the scheduling, record

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[1]Paulsen, "Mechanized Outpatient System" p. 86.

[2]Interview with Mr. H. J. Smith.

requesting, and statistical function in the clinics making possible the processing of more visits in an efficient fashion."[1]

The hospital has not attempted to develop a cost/benefit ratio in connection with the system. The costs are estimated to be $200,000 per year. Benefits are not as easy to quantify. The contention is that the primary goal is to improve patient care (two words which have never been quantified), not necessarily at less expense to the hospital.[2]

Summary

The central appointment system at Bethesda Naval Hospital is well designed and administered. Controls in effect indicate that statistical reporting is accurate. Standards such as cost per outpatient visit have not been developed because of the difficulty in computing these costs. The outpatient department is budgeted based on mission and functions performed rather than cost per outpatient visit.

Fitzsimons Army Hospital has not experienced any reduction in costs as a result of automating the outpatient department. Noticeable improvements did result in areas other than in cost reduction.

Children's Hospital also did not experience any savings in cost per outpatient visit as a result of automation. Some subjective feelings of improvement were expressed, but no statistical evidence was offered in support of this statement.

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[1]Letter from David A. Campana, Manager, Hospital Data Center, The Children's Hospital Medical Center, Boston, Mass., January 12, 1970.

[2]Ibid.

CHAPTER VI

CONCLUSION

It is apparent from the discussion in chapters III and IV that certain administrative outpatient department functions now performed manually in naval hospitals can be automated. An automated appointment system can be developed which would also afford a system of collecting and reporting statistics. To some extent, medical record data can also be automated.

However, because it is practical to do so does not mean that these functions should be automated. As chapter V points out, automated appointment systems at Fitzsimons Army Hospital and Children's Hospital have not resulted in any statistical evidence of reduced costs per patient visit.

Interestingly, Fitzsimons Army Hospital has attained the same benefits by automating that Bethesda Naval Hospital has achieved manually. These benefits are:

1. A simple procedure for gathering statistics.
2. Minimum amount of errors.
3. Clinic clerks can devote more of their time to actively assisting the doctor in direct patient care instead of making appointments.

It appears that these benefits have been attained not because of automation but because the functions of appointment making and statistical

gathering were centralized. Since Fitzsimons Army Hospital has not shown any evidence of cost savings (because of their system of centralization which utilizes a computer) indicates that there is no direct monetary advantage to the Navy by changing to an automated system. On the other hand, some additional advantages could be realized if the data that are collected in terms of workload are manipulated in ways other than simply printing out totals for reports. Simulation and modeling techniques would be useful in long-range planning. However, it is doubtful that the required skills are available in sufficient abundance to bring this to fruition. There are too many crises facing naval medical data processing managers at this time to foresee any advances in this area in the near future.

Naval hospitals not utilizing a central appointment system might consider the computer if a change to a central appointment system is contemplated. The system at Fitzsimons Army Hospital can be adapted to a naval hospital without much difficulty. Even though costs will not be reduced, a computerized system will develop certain skills in medical department personnel that will be useful at some future time. A thorough systems study required in connection with automation will reveal many inefficiencies in the existing manual system. This, in itself, is a worthwhile benefit of changing to an automated system.

An automated medical record system is not at the stage of development to justify a change from the conventional method of manually writing entries in the record. The conventional fixed-field technique utilized by Kaiser Foundation Hospitals and described by Schenthal and Levy is essentially a duplicate of the items of the check list which the physician considered

applicable to the patient. Although the fixed-field formats are easy to program, they do not permit the physician sufficient flexibility to record his impressions in his own words. The very act of consciously coding makes filling out the forms and work sheets time-consuming and, therefore, objectionable to clinical personnel.

The variable-field method of processing data affords the physician greater freedom and requires little change from the present methods of data acquisition for the medical record. Unfortunately, it leaves unsolved many of the problems of the present system, including standardization of terminology and lack of specificity. A really sophisticated approach would seem to depend on one of the two approaches.

The first approach would be the ability of the computer to understand (literally) natural written language. There has been great effort in this area (computer translation) for many years with no notable success.

The second approach would be the development of a structural language that resembles natural language (analogous to computer programming language FORTRAN or COBOL) for recording facts in a form both understandable by man and processable by computer.

Perhaps the system for automating medical records described by Payne in chapter IV is the most logical of those investigated. The role of the computer in automating the record may be determined by asking what parts of medical record procedures are worth automating? To what extent are they feasible and practical? And, above all, whether it would make sense economically.

The legal issues of automating the medical record must also be considered. Legal implications and ethical questions rule against the computerized medical record for clinical usage. For example, check-list histories are not permitted by hospital accreditation authorities. The problems of the written record and signature requirement must be resolved before true progress can be made in this area. The requirement for written signature exists and must be obeyed until such time as this is modified by the Joint Committee on Hospital Accreditation. Until these and other legal and ethical considerations discussed in chapter IV are resolved, the conventional record cannot be completely replaced by an automated one.

There is no doubt that computers can make possible much that could not have been attained without them. But, above all, naval medical personnel must make certain that hospital activities retain their focus on human values. What can occur is illustrated by the incident concerning a floor nurse trying to speak to a newly admitted four-year-old child over the intercom. Receiving no response, the nurse said a little sharply, "Jimmy, I know you're there." After a few seconds came Jimmy's quavering voice, "What do you want, Wall?"[1]

In applying computer technology, the naval medical department must be certain to avoid substituting Jimmy's wall for the human touch in its organizational relationships.

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[1]Gilbert C. Jacobus, "Sorting Sense From Nonsense in Hospital ADP Programs," Hospitals, May, 1967, p. 36.

APPENDIX

OUTPATIENT VISITS

Naval Hospitals and Medical Centers

Fiscal Year	1966	1967	1968	1969
ACTIVE DUTY	661,115	773,098	818,846	278,353
RETIRED	281,695	305,292	323,935	88,940
DEPENDENTS	2,718,307	2,917,026	3,126,376	939,643
OTHERS	114,648	120,502	118,158	42,315
TOTAL	3,775,765	4,115,918	4,387,315	1,349,251*
				4,797,000**
% increase	3.4%	9%	6.6%	7%
Overall percentage increase from FY 1965-1969				31.4%

*End first quarter, FY 1969
**Projected

Source: Management Information Center, Bureau of Medicine and Surgery, Navy Department, Washington, D.C.

OUTPATIENT VISITS

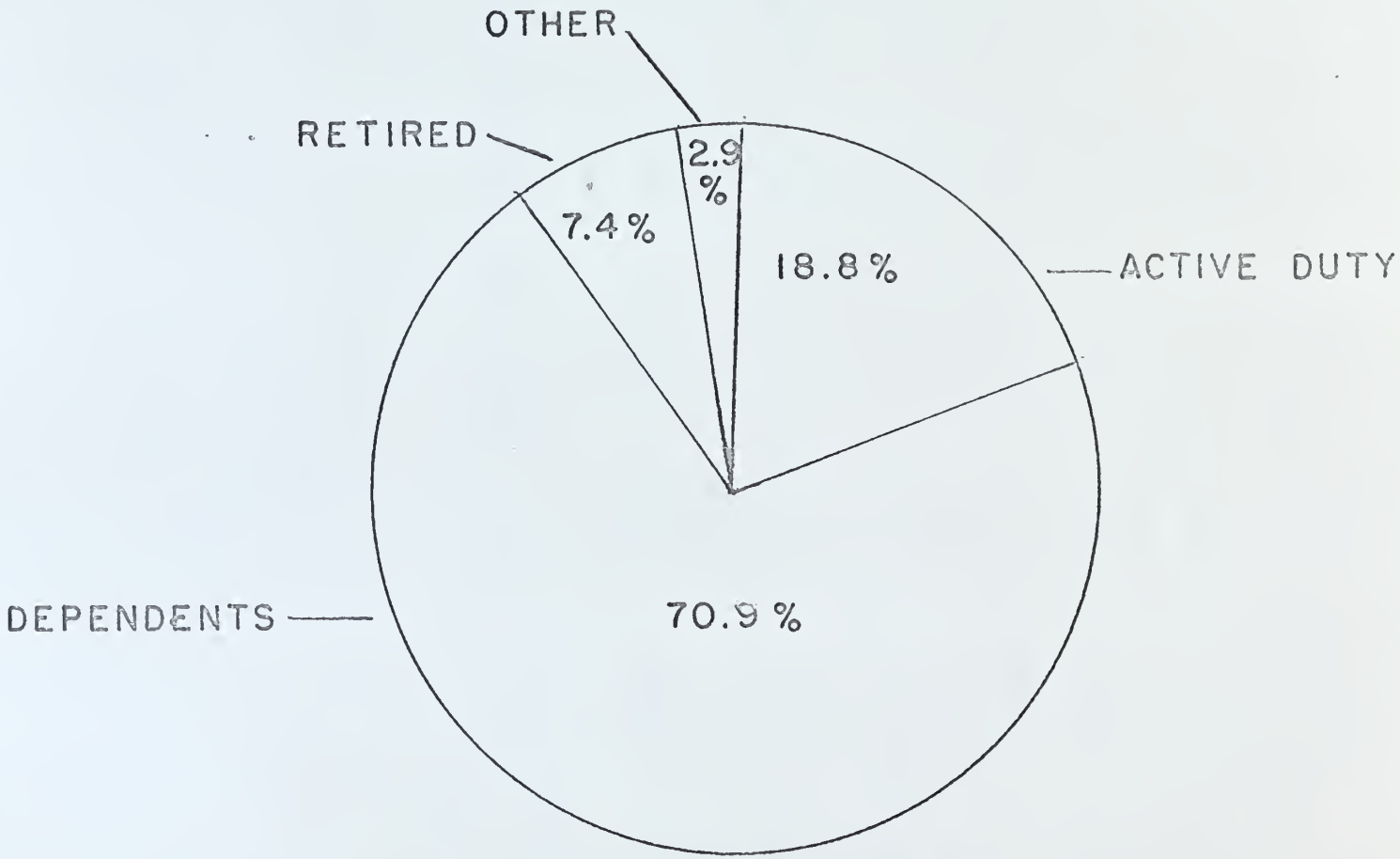
Worldwide

Fiscal Year	1966	1967	1968	1969
ACTIVE DUTY	7,400,294	7,933,597	8,227,328	2,147,898
RETIRED	383,870	413,963	450,445	119,108
DEPENDENTS	4,779,113	4,997,541	5,345,506	1,388,168
OTHERS	1,033,667	1,546,576	2,053,625	415,981
TOTAL	13,596,944	14,891,677	16,076,904	4,071,155*
				17,202,287**
% increase	6.4%	9.5%	8%	7%
Overall percentage increase from FY 1965-1969				54.9%

*End first quarter, FY 1969
**Projected

Source: Management Information Center, Bureau of Medicine and Surgery, Navy Department, Washington, D.C.

OUTPATIENT VISITS
NAVAL HOSPITALS AND MEDICAL CENTERS
FISCAL YEAR 1967



TOTAL VISITS — 4,115,918

Source: Management Information Center, Bureau of Medicine and Surgery, Navy Department, Washington, D.C.

MONTHLY OUTPATIENT CLINIC WORKLOAD

1964 through October 1969

Month	1964	1965	1966	1967	1968	1969
JANUARY	16,819	25,465	28,680	34,911	38,720	40,805
FEBRUARY	16,388	24,890	27,578	32,045	38,047	37,985
MARCH	19,061	30,281	33,793	38,311	40,037	41,823
APRIL	19,372	28,228	30,922	33,141	37,917	40
MAY	18,554	27,768	30,974	37,315	38,751	
JUNE	19,307	28,814	29,655	35,847	34,688	38,007
JULY	21,738	26,841	30,010	34,071	38,766	38,115
AUGUST	21,144	28,333	34,128	38,158	39,907	39,152
SEPTEMBER	23,261	27,595	32,309	35,369	39,241	38,908
OCTOBER	23,597	26,837	32,322	40,248	43,355	41,932
NOVEMBER	23,718	28,143	32,250	36,432	39,509	
DECEMBER	23,835	25,057	29,043	34,118	37,545	

Source: Outpatient Department, Naval Hospital, Bethesda, Maryland.

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